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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

B641/01

GATEWAY SCIENCE

CHEMISTRY B

**Unit 1 Modules C1 C2 C3
(Foundation Tier)**

THURSDAY 4 JUNE 2009: Morning

DURATION: 1 hour

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

**Candidates answer on the question paper
A calculator may be used for this paper**

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Pencil

Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **ALL** the questions.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- The Periodic Table is printed on the back page.

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Answer ALL the questions.

SECTION A – MODULE C1

1 This question is about food additives.

Food additives are given E numbers to identify them.

Look at the table. It gives some information about E numbers.

| <u>E NUMBER RANGE</u> | <u>TYPE OF FOOD ADDITIVE</u> |
|-----------------------|-----------------------------------|
| E 100 to E 199 | food colourings |
| E 200 to E 299 | preservatives |
| E 300 to E 399 | antioxidants |
| E 400 to E 600 | flavour enhancers and emulsifiers |

Look at part of the food label on a packet of sausages.

INGREDIENTS:

Pork, Water, Pork Fat, E 412, E 450, E 223,
E 300, E 307, E 120

(a) Which ingredient is present in the SMALLEST amount?

Choose from the food label.

_____ [1]

(b) What type of additive is E 450?

_____ [1]

(c) The sausages contain the ANTIOXIDANT E 300.

Explain why antioxidants are added to foods.

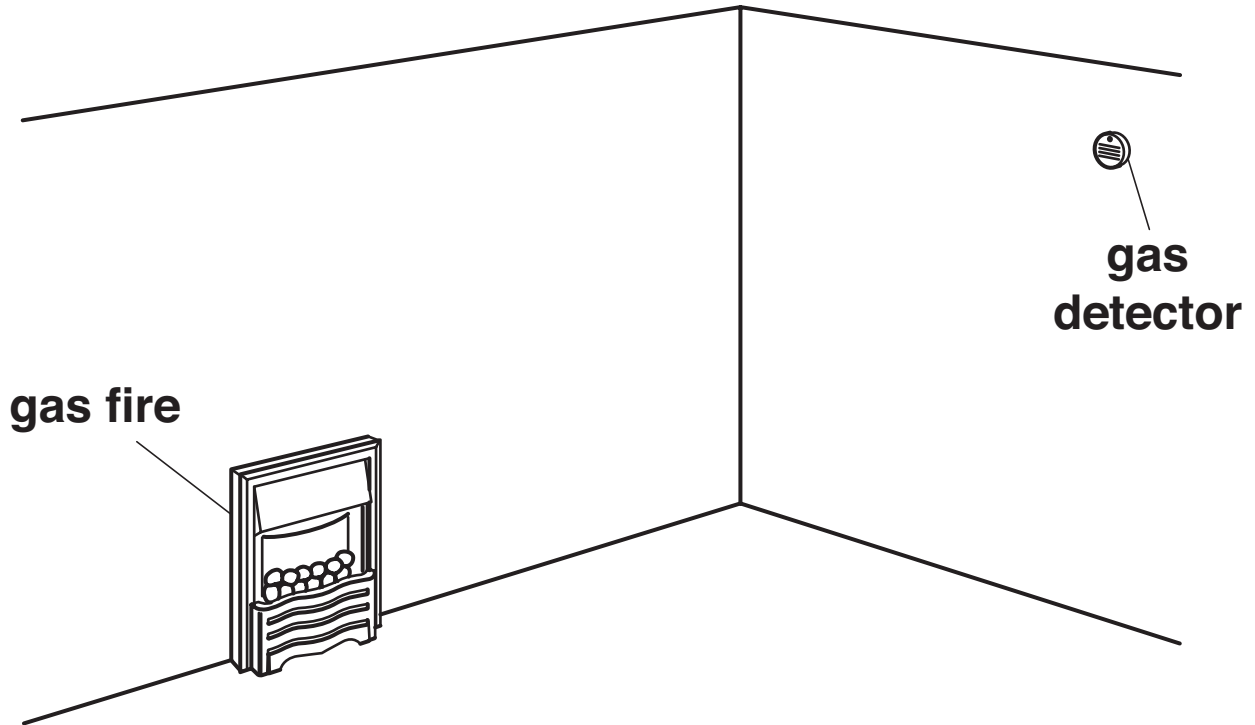
_____ [1]

[Total: 3]

2 This question is about the burning of fuels.

James and Anita move into a flat.

Look at the diagram of a room in the flat.



Look at the list of gases.

CARBON DIOXIDE

CARBON MONOXIDE

NITROGEN

OXYGEN

WATER VAPOUR

(a) The fire uses a fuel. The fuel reacts with a gas in the air.

Which gas?

Choose from the list.

_____ [1]

(b) The gas detector shows if a poisonous gas is being made.

Write down the name of this POISONOUS gas.

Choose from the list.

_____ [1]

[Total: 2]

3 The rose is a flower which has a very pleasant smell.

A perfume can be made from the oil in the rose.

The same perfume can be made in a laboratory. The perfume contains an ester.

(a) Colin makes this ester in a laboratory.

He adds an acid to an alcohol. Water is also made in this reaction.

(i) Write down the WORD equation for the making of this ester.

_____ [1]

(ii) What is the name given to perfumes made in a laboratory?

Put a ring around the correct answer.

ACTIVE

NATURAL

NEUTRAL

SYNTHETIC

[1]

(b) We can smell perfumes easily.

(i) Perfumes have a property that makes them easy to smell.

Which property?

_____ [1]

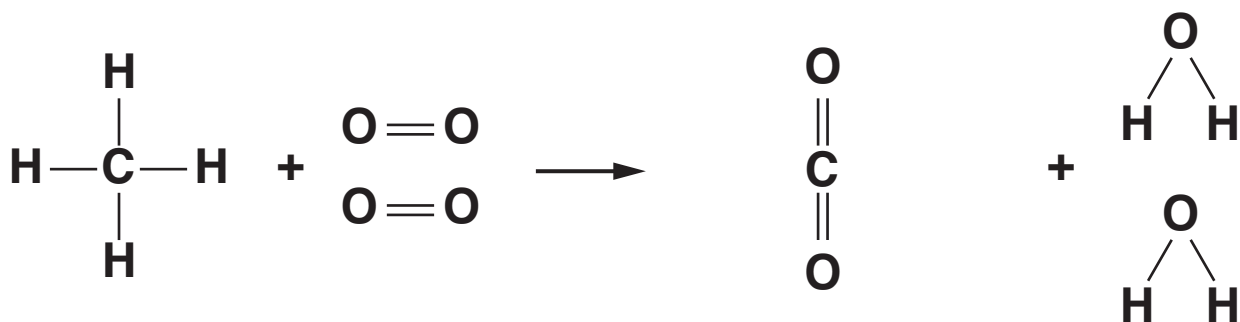
(ii) Some cells in our nose detect the smell of perfume.

What type of cell detects smells?

_____ [1]

[Total: 4]

- 4 (a) Look at the equations. They show what happens when methane burns.



METHANE + OXYGEN \longrightarrow CARBON DIOXIDE + WATER

- (i) Write down the name of one of the REACTANTS in the equation.

_____ [1]

- (ii) Look at the displayed formula of methane in the equation.

Write down the TOTAL number of ATOMS in one molecule of methane.

answer _____ [1]

- (iii) Look at the displayed formula of carbon dioxide in the equation.

Write down the number of different TYPES of atoms in carbon dioxide.

answer _____ [1]

(b) Complete the sentence.

The burning of methane is an exothermic reaction.

Energy is _____ the surroundings.
[1]

[Total: 4]

5 A special material called Gore-Tex[®] is used to make many outdoor clothes.

Jill buys a coat made of Gore-Tex[®].

Gore-Tex[®] has a number of useful properties.

Two of these properties are:

- it is waterproof
- it is breathable.

(a) Why do people wear WATERPROOF clothing?

[1]

(b) Jill wears her Gore-Tex[®] coat when she goes climbing.

Gore-Tex[®] is breathable.

Describe one ADVANTAGE of Gore-Tex[®] being breathable.

[1]

(c) Gore-Tex[®] is waterproof and breathable.

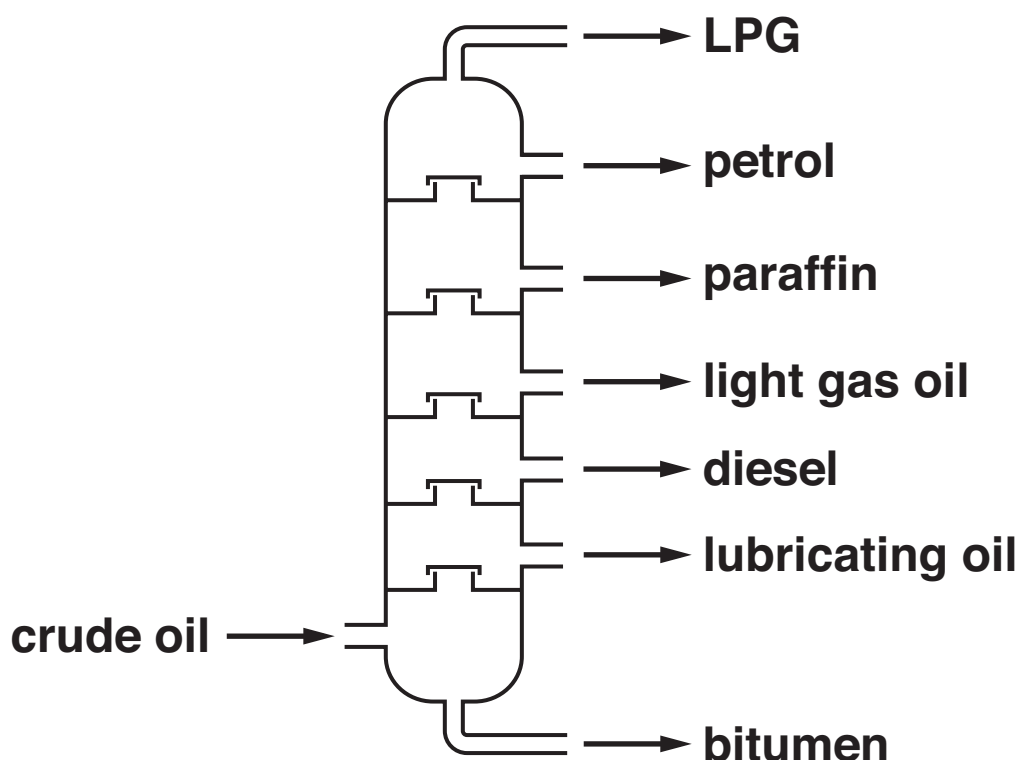
Describe ONE OTHER useful property of Gore-Tex[®].

[1]

[Total: 3]

6 Crude oil is separated into useful substances by fractional distillation.

Look at the diagram. It shows a fractionating column.



(a) The LPG exits from the top of the fractionating column.

Explain why.

Use ideas about boiling points.

[1]

(b) The petrol fraction contains octane, C_8H_{18} .

Octane is a HYDROCARBON.

Explain why.

_____ [2]

(c) Describe ONE use for petrol.

_____ [1]

[Total: 4]

SECTION B – MODULE C2

7 (a) Many materials are used to build houses.

Two of these are concrete and glass.

Write down two OTHER materials used to build houses.

1 _____

2 _____ [2]

(b) Concrete is made by mixing cement, water and one other substance.

(i) Which other substance is added?

Choose from the list.

LIMESTONE

MARBLE

SALT

SAND

answer _____ [1]

(ii) Concrete can be reinforced. This makes it stronger.

How is concrete reinforced?

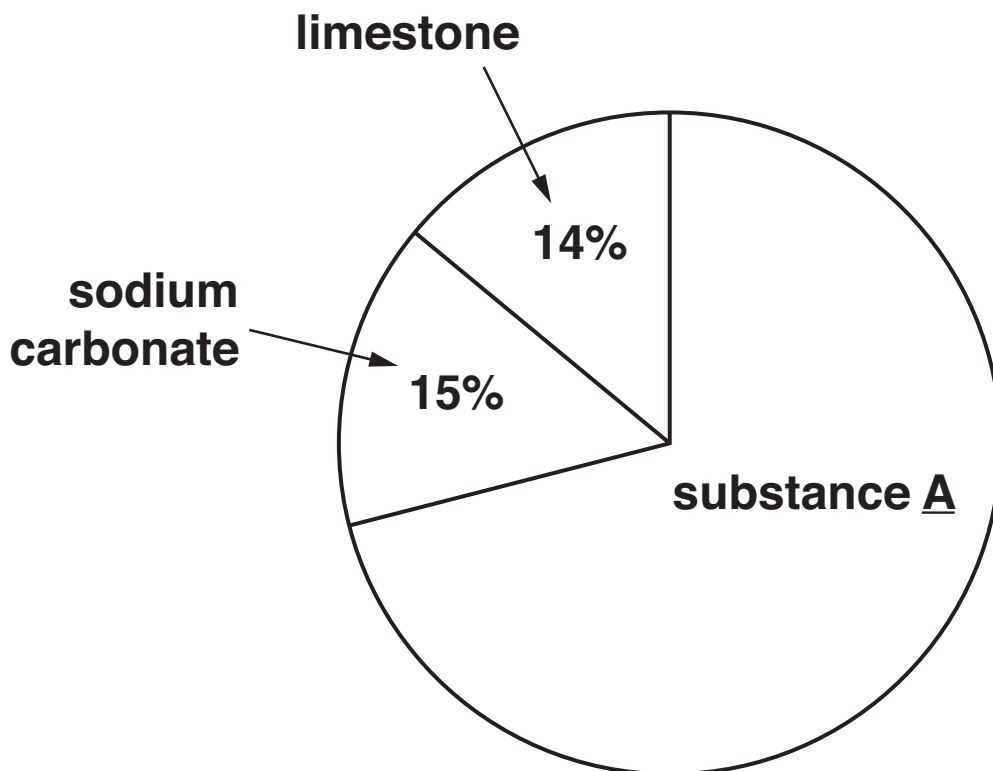
_____ [1]

(c) Glass is made by mixing and heating three materials.

Two of them are sodium carbonate and limestone.

Look at the pie chart.

It shows the percentages of different materials used to make one type of glass.



(i) Write down the name of substance A.

_____ [1]

(ii) Calculate the percentage of substance A.

_____ [1]

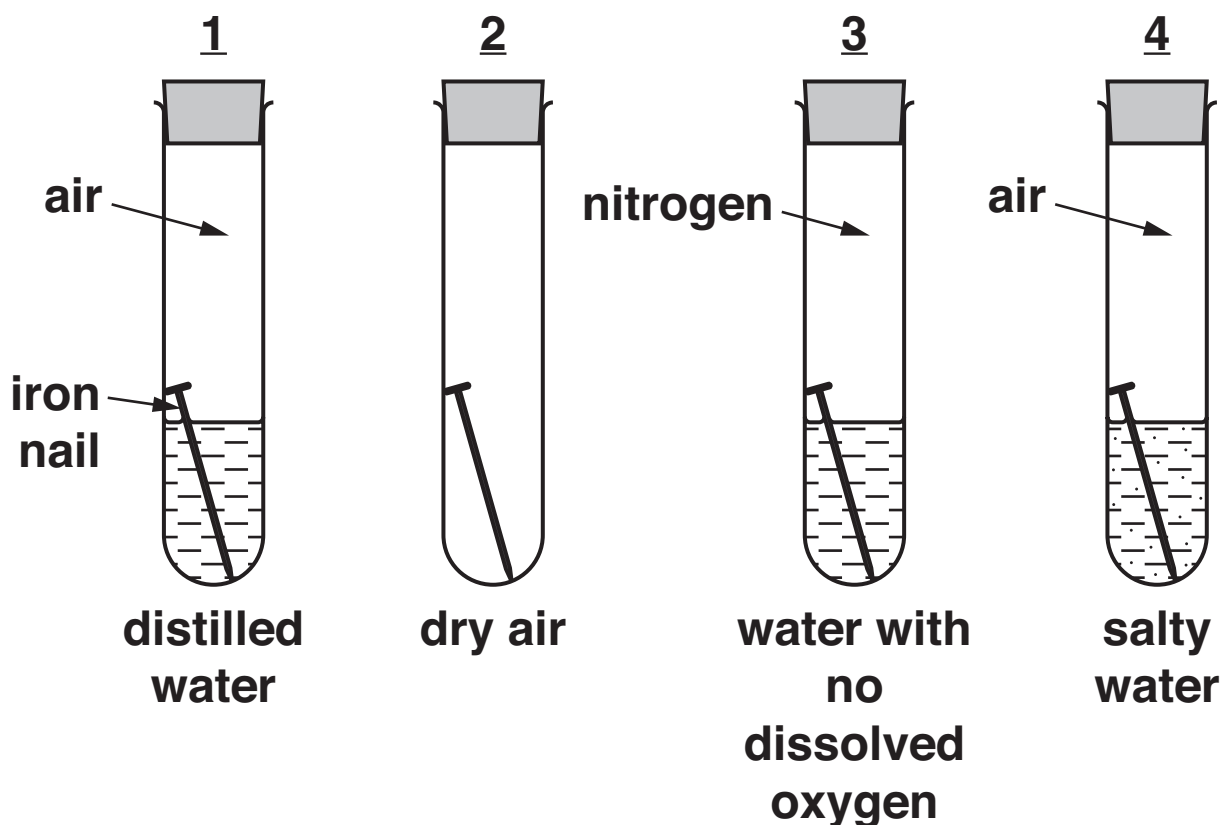
[Total: 6]

8 Nigel investigates the rusting of iron.

Look at the diagram.

It shows how he sets up his investigation.

Each test tube contains an iron nail.



After 2 weeks the nail in tube 1 was a bit rusty.

The nails in tubes 2 and 3 were not rusty.

The nail in tube 4 was very rusty.

(a) Two substances are needed for iron to rust.

Which TWO substances?

1 _____

2 _____ [2]

(b) What substance speeds up rusting?

_____ [1]

(c) Nigel repeats the investigation using aluminium instead of iron.

Aluminium does not corrode in any of the experiments.

Explain why.

_____ [2]

[Total: 5]

9 Look at the table.

It shows the concentration of some gases found in the atmosphere over the last 100 years.

| <u>YEAR</u> | <u>CONCENTRATION OF OXIDES OF NITROGEN IN PARTS PER MILLION</u> | <u>CONCENTRATION OF CARBON DIOXIDE IN PARTS PER MILLION</u> |
|--------------------|--|--|
| 1900 | 18 | 300 |
| 1920 | 18 | 305 |
| 1940 | 20 | 310 |
| 1960 | 25 | 320 |
| 1980 | 30 | 340 |
| 2000 | 35 | 370 |

- (a) (i) How does the concentration of OXIDES OF NITROGEN change from 1900 to 2000?**

_____ [1]

- (ii) Suggest what the concentration of CARBON DIOXIDE might be in the atmosphere in the year 2020.**

concentration _____ parts per million

Explain your answer.

_____ [1]

(b) Oxides of nitrogen are pollutants in the air.

Where do the oxides of nitrogen come from?

_____ [1]

(c) Sulfur dioxide is another gas that pollutes the air.

It is made when sulfur impurities in fossil fuels burn.

What environmental problem can sulfur dioxide cause?

_____ [1]

[Total: 4]

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10 John reacts calcium carbonate with hydrochloric acid.

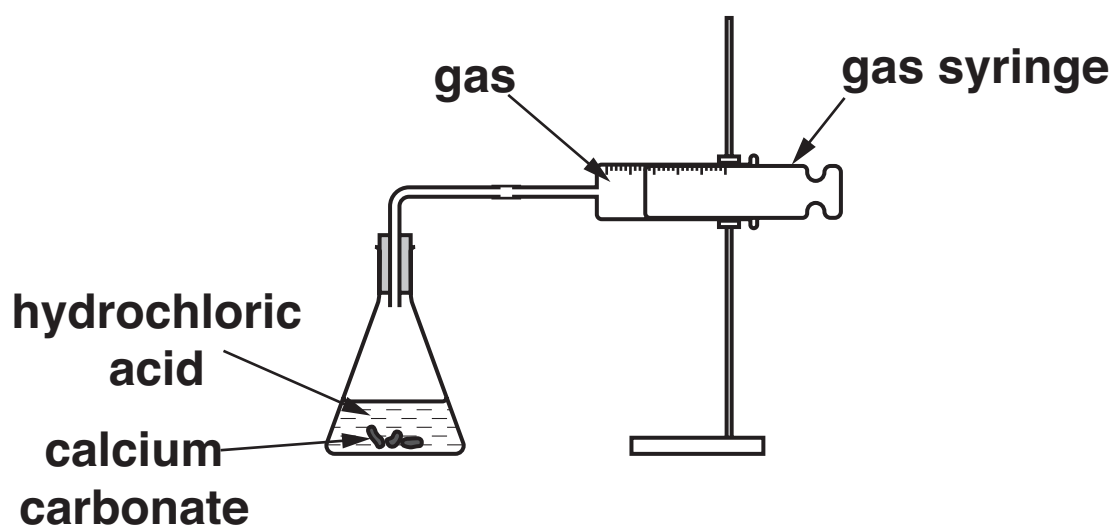
Carbon dioxide gas is made and collected.

He does the experiment twice.

He uses the same amount of each chemical.

In the first experiment the acid is at 20 °C.

In the second experiment the acid is at 40 °C.



(a) Look at the graph opposite. It shows his results.

(i) Both reactions give the same final volume of gas.

What is the final volume of gas?

_____ cm^3 [1]

(ii) Complete the sentence.

At 2 minutes the reaction at 40°C has made 60cm^3 of gas.

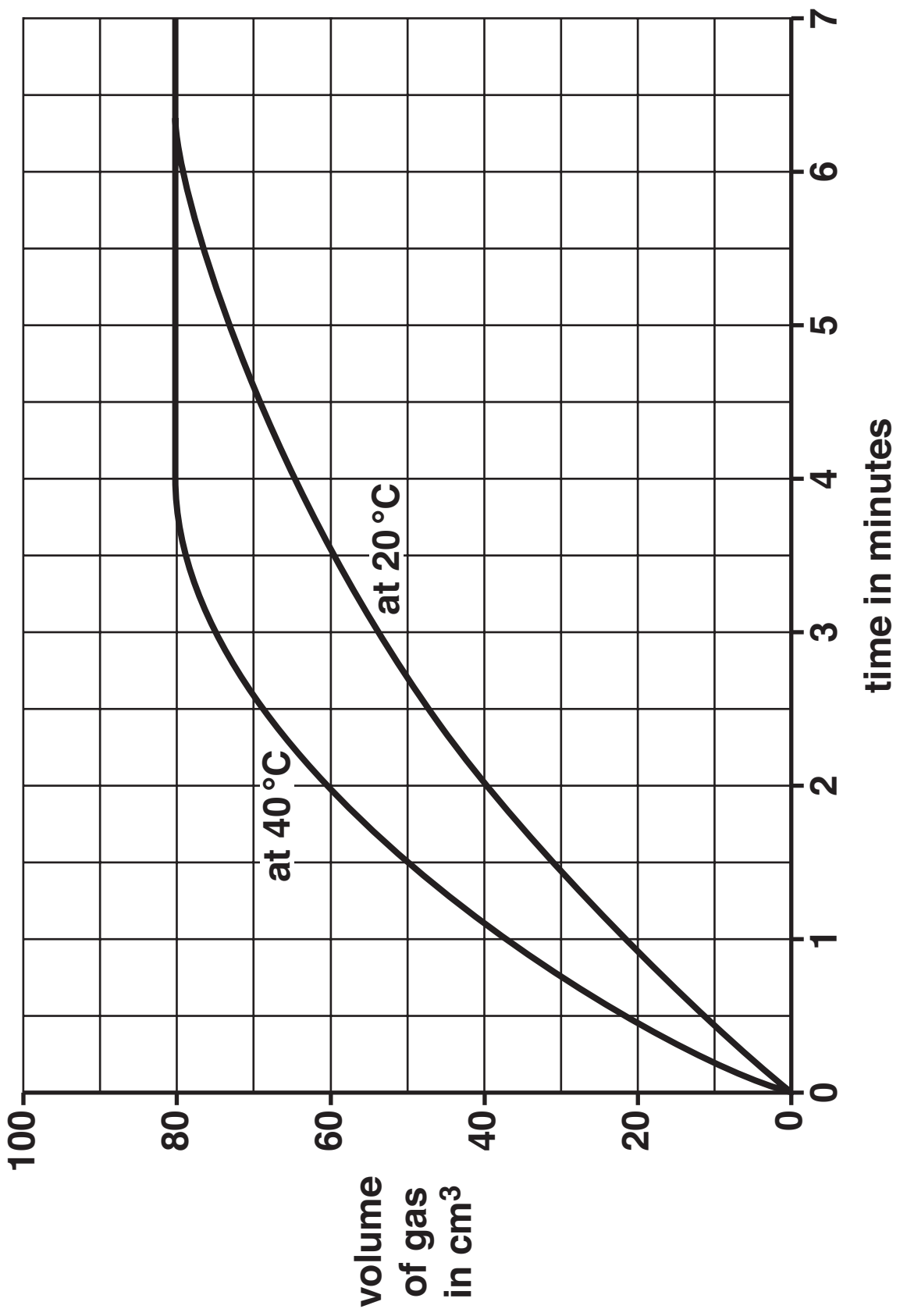
At 2 minutes the reaction at 20°C has made

_____ cm^3 of gas. [1]

(iii) Which reaction is faster, the one at 20°C or at 40°C ?

Use the GRAPH to explain your answer.

_____ [1]



(b) Suggest why the reaction stops.

_____ [1]

(c) One way of speeding up a reaction is to increase the temperature.

Write down one OTHER way of speeding up a reaction.

_____ [1]

[Total: 5]

SECTION C – MODULE C3

11 This question is about the uses of different elements.

Draw a straight line to join each ELEMENT to its USE.

| <u>ELEMENT</u> | <u>USE</u> |
|----------------|--------------------------------|
| chlorine | building bridges |
| copper | sterilising cuts and wounds |
| iodine | making electrical wires |
| iron | making pesticides and plastics |

[3]

[Total: 3]

12 Copper and iron are transition elements.

All the transition elements are metals.

(a) Write down the name or symbol of ONE OTHER transition element.

Use the Periodic Table on the back page to help.

_____ [1]

(b) One physical property of metals is that they have high tensile strength.

Write about OTHER physical properties of metals.

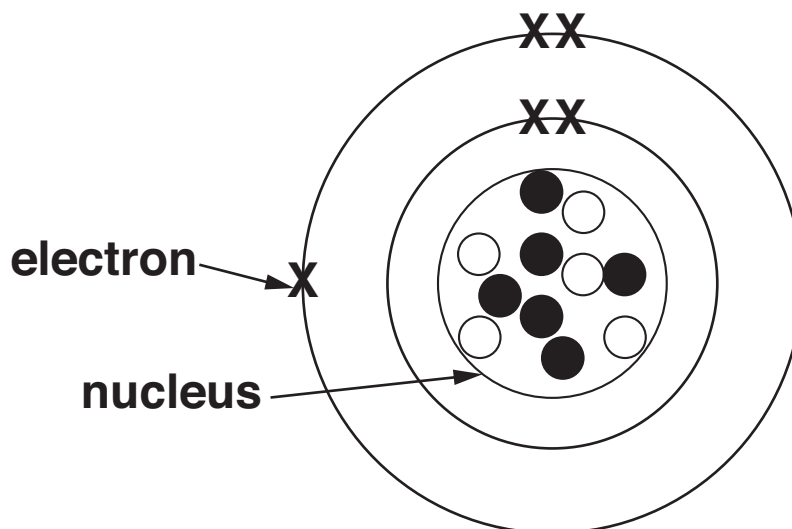
_____ [3]

[Total: 4]

13 This question is about atomic structure.

Look at the diagram.

It shows the structure of an atom.



○ = a proton

● = a neutron

(a) What is the ATOMIC number of this atom?

_____ [1]

(b) What is the MASS number of this atom?

_____ [1]

(c) An element is made up of these atoms.

(i) Which GROUP of the Periodic Table is this element in?

_____ [1]

(ii) Which PERIOD of the Periodic Table is this element in?

_____ [1]

[Total: 4]

14 Sodium is an alkali metal.

It is in Group 1 of the Periodic Table.

(a) Write down the name or symbol of ONE OTHER alkali metal.

_____ [1]

(b) Sodium is stored in a bottle.

The sodium is covered with oil. The oil stops sodium reacting with water.

Write down one OTHER reason why sodium must be stored under oil.

_____ [1]

(c) Sodium reacts with cold water.

A colourless gas and an alkaline solution are made.

Look at the balanced symbol equation for this reaction.



(i) What is the NAME of the colourless gas made?

_____ [1]

(ii) What is the NAME of the alkaline solution made?

_____ [1]

[Total: 4]

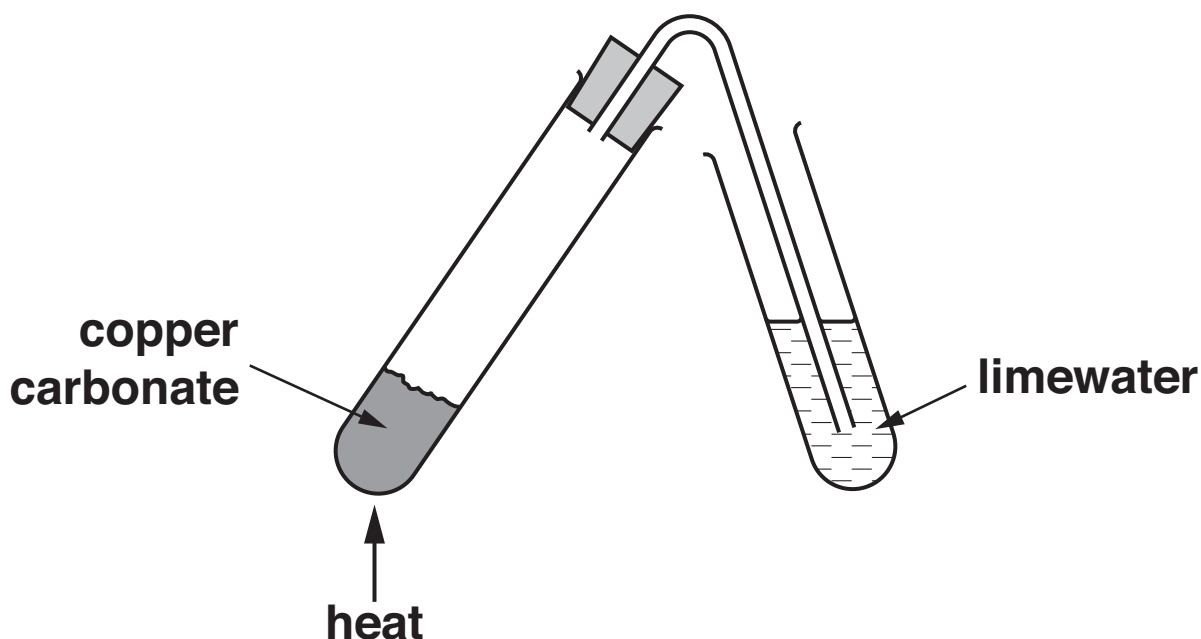
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15 Beth investigates the thermal decomposition of copper carbonate.

Look at the word equation for this decomposition.

copper carbonate \rightarrow copper oxide + carbon dioxide

Look at the diagram. It shows the apparatus she uses.



She measures the mass of the copper carbonate before heating.

She also measures the mass of the copper oxide after heating.

Look at her results.

| | <u>MASS IN GRAMS</u> |
|---------------------------------|----------------------|
| copper carbonate before heating | 2.21 |
| copper oxide after heating | 1.43 |

(a) What is the mass of carbon dioxide made?

_____ g [1]

(b) The carbon dioxide is bubbled through the limewater.

Describe what happens to the limewater.

_____ [1]

(c) What is meant by THERMAL DECOMPOSITION?

_____ [1]

(d) Beth uses the internet to find out about other metal carbonates.

She finds out the temperature needed to decompose different carbonates.

Look at the table. It shows these temperatures.

| <u>CARBONATE</u> | <u>TEMPERATURE NEEDED TO DECOMPOSE CARBONATE IN °C</u> |
|---------------------|--|
| copper carbonate | 375 |
| iron(III) carbonate | -25 |
| manganese carbonate | 500 |
| zinc carbonate | 400 |

(i) Which carbonate needs the HIGHEST temperature to decompose?

Choose from the carbonates in the table.

answer _____ [1]

- (ii) Most carbonates need to be heated before they will decompose.

Which carbonate will decompose WITHOUT being heated by a Bunsen burner?

Choose from the carbonates in the table.

answer _____ [1]

[Total: 5]

END OF QUESTION PAPER

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The Periodic Table of the Elements

| | | | | | | | | |
|---|--------------------------------------|--------------------------------------|--|------------------------------------|---------------------------------------|-------------------------------------|-------------------------------------|---------------------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | |
| 7 Li lithium 3 | 9 Be beryllium 4 | 11 Na sodium 11 | 12 C carbon 6 | 13 Al aluminium 13 | 14 N nitrogen 7 | 15 O oxygen 8 | 16 F fluorine 9 | 17 Ne neon 10 |
| 19 K potassium 19 | 20 Ca calcium 20 | 23 Sc scandium 21 | 24 Ti titanium 22 | 25 V vanadium 23 | 26 Cr chromium 24 | 27 Mn manganese 25 | 28 Fe iron 26 | 29 Co cobalt 27 |
| 37 Rb rubidium 37 | 38 Sr strontium 38 | 39 Y yttrium 39 | 40 Zr zirconium 40 | 41 Nb niobium 41 | 42 Mo molybdenum 42 | 43 Tc technetium 43 | 44 Ru ruthenium 44 | 45 Rh rhodium 45 |
| 55 Cs caesium 55 | 56 Ba barium 56 | 57 La* lanthanum 57 | 72 Hf hafnium 72 | 73 Ta tantalum 73 | 74 W tungsten 74 | 75 Re rhenium 75 | 76 Os osmium 76 | 77 Ir iridium 77 |
| 87 Fr francium 87 | 88 Ra radium 88 | 89 Ac* actinium 89 | 104 Rf rutherfordium 104 | 105 Db dubnium 105 | 106 Sg seaborgium 106 | 107 Bh bohrium 107 | 108 Hs hassium 108 | 109 Mt meitnerium 109 |
| 133 Cs caesium 55 | 137 Ba barium 56 | 139 La* lanthanum 57 | 178 Hf hafnium 72 | 181 Ta tantalum 73 | 184 W tungsten 74 | 186 Re rhenium 75 | 190 Os osmium 76 | 192 Ir iridium 77 |
| 131 Xe xenon 54 | 127 I iodine 53 | 122 Sb antimony 51 | 119 Sn tin 50 | 115 In indium 49 | 112 Cd cadmium 48 | 108 Ag silver 47 | 106 Pd palladium 46 | 103 Rh rhodium 45 |
| 36 Kr krypton 36 | 35 Br bromine 35 | 33 As arsenic 33 | 32 Ge germanium 32 | 31 Ga gallium 31 | 30 Zn zinc 30 | 29 Cu copper 29 | 28 Ni nickel 28 | 27 Co cobalt 27 |
| 86 Rn radon 86 | 85 At astatine 85 | 83 Bi bismuth 83 | 82 Pb lead 82 | 81 Tl thallium 81 | 80 Hg mercury 80 | 79 Au gold 79 | 78 Pt platinum 78 | 77 Ir iridium 77 |
| [222] Rn radon 86 | [210] At astatine 85 | [209] Po polonium 84 | 207 Pb lead 82 | 204 Tl thallium 81 | 201 Hg mercury 80 | 197 Au gold 79 | 195 Pt platinum 78 | 192 Ir iridium 77 |
| Elements with atomic numbers 112-116 have been reported but not fully authenticated | | | | | | | | |

| | |
|---|---------------------------|
| 1 | H hydrogen 1 |
|---|---------------------------|

| |
|------------------------|
| relative atomic mass |
| atomic symbol |
| name |
| atomic (proton) number |

* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.